# American Traffic Solutions:
# Cost-Benefit Analysis

## The Impact of Red-Light Safety Cameras on Crashes and Resulting Savings to Communities: Methodology and Documentation

**Prepared for:**


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# American Traffic Solutions Cost-Benefit Analysis Model Methodology

## Executive Summary:

Every traffic crash diminishes a community in many ways, most notably by the lives that are lost and those that are changed forever. It is impossible to calculate the intangible costs of even one traffic fatality, but the economic cost to a community can be measured.

The measurable costs, which have been calculated by the U.S. Department of Transportation, are immense and affect everyone. These costs include medical, emergency services, property damage, lost productivity, the monetized value of pain and suffering, lost quality of life, travel delays, insurance administration and legal and court costs.

A reduction in the number of traffic crashes translates into a direct savings for the community. Red-light safety cameras help reduce crashes, including the dangerous right-angle collisions. By doing so, the cameras contribute an economic benefit to the community.

American Traffic Solutions (ATS) wanted to know the dollar value of this economic benefit. Seeking an objective third party to conduct the analysis, ATS commissioned John Dunham and Associates to do an economic cost-benefit study. The New York-based economic research firm specializes in economic and fiscal impact studies, including cost-benefit analyses.

This study applied a conservative approach, using only the most basic factors for costs and savings. The researchers were able to calculate the estimated cost savings to a community from the deployment of one red-light safety camera at one busy intersection approach in 25,000 cities and towns in all 50 states and the District of Columbia. Cost was calculated using the $57,000 annual fixed fee cities pay ATS for one camera from fines paid by violators. Savings were based solely on the costs that are avoided through the reduction in traffic crashes, and salary costs that are avoided if officers were called away from patrol work and redeployed to provide 24-hour traffic enforcement. Ticket revenues were not included in the savings calculations partly because of the great variance among communities, but primarily because the study seeks to show the savings a community realizes without collecting a dollar in revenue from fines.

City-specific savings can be reviewed at http://www.atsol.com/economicbenefit. Calculations were estimated over a five-year period.

Along with calculating the savings for 25,000 cities and towns, this study looked directly at those 195 municipalities served by ATS and provided an estimated average savings for that subgroup. Although ATS has red-light safety cameras in more than 195 localities, the model in this study can only be applied to cities, so counties, townships and other law enforcement jurisdictions were not included.

The analysis also did not attempt to calculate the cumulative savings resulting from the installation of multiple cameras per community. Multiplying the number of cameras in a community by the cost savings resulting from one camera should not be done, as it will result in a misleading and inaccurate number.

The savings varied from city to city due to the variety of factors that were included in the methodology used. For instance, the analysis shows a savings in Hazelwood, Missouri, of $163,036 from one red-light safety camera in the first year of operation and a cumulative savings of $728,952 over the course of five years. In St. Petersburg, Florida, the savings is $187,440 in the first year and accumulates to $846,849 over five years. In Linden, New Jersey, the savings is $289,184 in the first year and amounts to more than $1.3 million in cumulative savings over five years.

In conclusion, it's useful to note that this study breaks new ground in the effort to inform the general public about the benefits that result from fewer traffic collisions. While this study concentrates on the measurable economic benefits a city can realize with a single red-light safety camera, ATS and Dunham and Associates understand the greatest benefit any community can achieve through enhanced road safety programs is saving people's lives.

**Introduction:**

Historically, traffic crashes resulting in fatalities, injuries and property damage have increased along with the number of cars on the road. In more recent years, however, these types of crashes have begun to decrease. One of the contributing factors to this decline is the growing prevalence of red-light safety cameras in municipalities across the country.[1] Numerous academic and governmental studies on these cameras illustrate their growing effectiveness in reducing crashes and the costs associated with them. This study seeks to show the economic benefit a community can achieve through decreased traffic crashes that result from the use of one red-light camera at one intersection approach. The benefit is calculated to reflect only the savings from avoided crashes and the redeployment of officers, and not any ticket revenue beyond the amount needed to pay for one red-light safety camera. Using this approach, this study provides the economic savings a community might expect from a single red-light safety camera without earning a dollar in revenue.

It is estimated that an average of 209,000 red-light related crashes occur annually in the United States.[2] As this analysis demonstrates, red-light safety cameras are an effective way for a community to save lives and avoid the costs associated with red-light running related traffic crashes, which typically involve right-angle crashes.

For every crash that occurs in the United States there is an economic cost. This includes losses in personal productivity, medical costs, insurance administration, legal costs, emergency service costs, and travel delays. According to the National Highway Traffic Safety Administration, the total economic cost of motor vehicle crashes was more than $230 billion in 2000,[3] which is equal to more than $300 billion in 2011 dollars. Economic costs vary, depending on the type of crash and whether it resulted in death, injury or property damage.

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1 Institute of Transportation Engineers. *Two Decades of Photo Enforcement in the U.S*. (2010).

2 Ibid.

3 U.S. Department of Transportation National Highway Traffic Safety Administration, *The Economic Impact of Motor Vehicle Crashes*, (2002).

Table 1 below illustrates the cost of an individual right-angle crash by outcome.

**Table 1:**
**Costs Associated with Right-Angle Crashes by Level of Injury in 2011**

| Crash Result | Right-Angle |
|---|---|
| Fatality | $5,553,842 |
| Disabling Injury | $560,492 |
| Evident Injury* | $234,251 |
| Possible Injury | $91,939 |
| Property Damage | $25,347 |

**Source:** U.S. Department of Transportation Federal Highway Administration

Every car crash that is prevented as a result of a driver slowing down on yellow and stopping on red at an intersection results in savings. This study used one model to calculate those savings on a national scale. From that, the estimated savings for 25,000 cities and towns could be determined. For the 195 cities and towns using red-light safety cameras managed and operated by ATS, the study showed one camera at one intersection saves on average $190,415 in avoided crash and redeployment costs in one year.[4] Combined, these 195 cameras in 21 states and the District of Columbia save their communities an estimated $37.1 million in a single year.

It is important to note that this study only addresses the savings resulting from one camera at one busy intersection approach for each of the 25,000 cities including the 195 municipalities served by ATS.** The actual number of ATS cameras per community ranges from less than 10 to more than 150. This analysis did not attempt to calculate the cumulative savings resulting from the installation of multiple cameras per community. Attempting to multiply the savings from one camera by the number of cameras in a given community is not useful and will not result in an accurate estimate of the total cost savings from red-light cameras.

Table 2 provides a summary of the number of cities and towns with ATS' red-light safety cameras in operation and their estimated savings from redeployment and avoided crash costs.

**Table 2:**
**Total Estimated Savings in a Single Year for Cities with ATS Cameras[5]**

| Cities | Average Savings | Total Savings |
|---|---|---|
| 195** | $190,415 | $37,130,879 |

[4] These exclude special jurisdictions, municipalities and bus lanes such as townships in New Jersey, cameras operated by state police and highway patrol agencies.

[5] Savings estimate is based on one camera located in a given city at one intersection approach. Additional cameras that may exist in a city were not included in this estimate.

* An evident injury is a non-incapacitating injury such as abrasions, bruises or minor lacerations.

** ATS has red-light safety cameras located in 231 different localities. These include cities, counties, townships and law enforcement jurisdictions. This model can only estimate the savings by city and as a result other localities and jurisdictions have been excluded.

## Methodology

### Data and Calculation:

The American Traffic Solutions Cost Benefit model is an analysis that weighs the annual fee of a camera operation ($57,000 a year) monitoring a busy intersection against the economic benefits that cameras produce from reductions in crashes and savings from police not having to monitor an intersection as intensely. The model begins with an estimate of the number of road intersections in the United States for a given city or town. This was calculated with Maptitude Geographic Information System (GIS), which overlaid road intersection data with U.S. Census data on municipalities. This provided intersection totals for more than 25,000 cities and towns in the U.S.

Data were gathered on the most recent population estimates of each of these cities from the U.S. Census Bureau. Included in the model were federal, state and local crash data from the U.S. Department of Transportation, National Highway Traffic Safety Administration Fatality Analysis Reporting System (FARS), and the U.S. Bureau of Transportation Statistics. These data included numbers of fatalities, injuries, and property damage from traffic crashes that occurred across the country for the most recent data available, ranging from 2008 to 2010. These data were used to calculate the distribution of crashes that resulted in fatalities, injuries or property damage at the local level.

Given the difficulty in obtaining accurate data on small to medium-sized cities and towns across all 50 states, a regression analysis was conducted to estimate the number of crashes in all cities. The two significant variables used in the analysis were population and the number of intersections in the city. The results of this analysis were then compared to bigger cities for which we had crash data. This allowed us to observe the accuracy of the regression analysis that was conducted. For example, the actual number of crash fatalities in Los Angeles in 2010 was 244.[6] The regression analysis predicted that Los Angeles had 243. Furthermore, the variables used in the regression analysis fell below the 0.05 significance level and the overall model had an r-square of 0.89, making it rather robust.

To further separate crashes by type, including red-light violation crashes, a literature review of academic articles and government studies on red-light camera effectiveness was conducted. These included studies by the U.S. Department of Transportation Federal Highway Administration, National Safety Council, the City of Milwaukee, Wisconsin, and the Institute of Transportation Engineers. The results of these studies yielded estimates for percent reductions in fatalities, injuries and property damage as well as percentages for the frequency of these crashes at intersections with red-light signal controls. The National Safety Council report titled *Analysis of Intersection Fatal and Nonfatal Crashes from 2005 to 2009* offered data used to calculate reductions in fatalities of 4.1 percent, reductions in injuries of 1.7 percent, and reductions in property damage of 6.8 percent. These percentages were applied to the crash data to estimate crashes and to estimate the effectiveness of red-light cameras at reducing the costs associated with traffic crashes at controlled intersections.

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[6] Federal Highway Safety Administration Fatality Analysis Reporting System (2010).

One of the frequently debated arguments over red-light cameras is whether they are for revenue or for safety. To contribute to the available studies relevant to this debate, this cost-benefit analysis looks strictly at the savings that occur from reductions in crashes stemming from the existence of a red-light safety camera at a given intersection, as well as the savings red-light cameras provide a police department. This approach was taken to provide a genuine analysis of the economic effect a community would realize from a reduction in red-light running crashes that is clearly distinct from any ticket revenue collected beyond the amount needed to cover the annual camera fee.

It's useful to note here that while ATS charges a fee for its cameras, communities use ticket fines paid by violators to pay those fees.

The analysis determined the savings to police based on what the department would pay three officers at the average annual wage of their state. Seeing that it would take three separate officers working eight-hour shifts to match the 24-hour uninterrupted coverage of a camera, the study factored in the annual wages of three police officers using data from the U.S. Bureau of Labor Statistics. Even though this method is limited in that wages do not include weekend or overtime hours and so do not fully match the continuous 24-hour, seven-days-a-week coverage red-light safety cameras provide, it is helpful in that it shows clearly what a community is saving in police hours if it sought just 120 hours of the same level of enforcement. Costs vary among communities, but in each case the use of this technology enhances the work police departments provide to their communities in a safe and consistent manner while allowing officers to focus on other enforcement issues.

Once all the data were gathered and the regression used to estimate crashes at the city and town level were distributed, the data were then broken down to an individual intersection. Assuming that red-light safety cameras are placed at higher-volume intersections, the number of crashes per intersection were estimated and adjusted to reflect a busier and more crash-prone intersection, such as those that generally would warrant red-light safety cameras.[7]

**Model:**

The American Traffic Solutions Cost Benefit model assumes that red-light safety cameras would decrease each type of crash outcome (fatality, injury or property damage) by the annual percent reductions highlighted in the *Analysis of Intersection Fatal and Non-Fatal Crashes from 2005 to 2009* by the National Safety Council. The societal benefit of these crash reductions is captured in the avoided costs associated with preventing these outcomes.

Estimates of total crash costs attempted to capture the full cost resulting from a crash over a victim's expected lifetime. These costs include medical, emergency services, property damage, lost productivity, the monetized value of pain and suffering, lost quality of life, travel delay,

[7] Crashes per intersection were multiplied by 9.495. This figure reflects the number of crashes per camera enforced intersection in a study on the effectiveness of red light cameras in Milwaukee, Wisconsin. Kriz, Karin Christian Moran, and Molly Regan. *Analysis of a Red Light Camera Program in the City of Milwaukee*. University of Wisconsin-Madison. Prepared for the City of Milwaukee Dept. of Administration, 2006.

insurance administration and legal and court costs.[8] Some of these costs are directly borne by taxpayers, businesses and families but they all affect the community. These costs, based on two separate U.S. Department of Transportation studies, estimate a crash fatality to cost $4,803,555, a crash injury with high severity to cost $282,124, and a cost of $21,923 for crashes resulting solely in property damage.[8] These crash costs were adjusted to 2011 dollars using the U.S. Bureau of Labor Statistics Consumer Price Index (see Table 1 for adjusted figures). Given the varying severity of injuries in car crashes, we used a weighted average to calculate the average cost of an injury based on the frequency of injuries occurring in car crashes. Additionally, the net values used in the analysis are presented in present value terms and were discounted at a rate of 4 percent.[9]

The model further assumes an analysis of one camera at one intersection with higher than average levels of traffic. It is recognized that multiple intersections across the country have more than one camera. However, if more than one camera is present at an intersection its influence on reducing crashes is expected but difficult to quantify, so this study looked strictly at the impact of one camera at one intersection approach. Another assumption that was made is that each camera is on a five-year contract with a city and therefore the analysis includes the costs of operating a camera at an intersection for the duration of a five-year period.

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8 Crash cost estimates are based on two studies from the U.S. Department of Transportation. Blincoe et al. *The Economic Impact of Motor Vehicle Crashes*. U.S. Department of Transportation, 2002. Council et al. *Safety Evaluation of Red Light Cameras.* U.S. Department of Transportation Federal Highway Administration. 2005. These are the original costs and have been adjusted to 2011 dollars for the model (see Table 1).

9 Crash cost estimates are based on two studies from the U.S. Department of Transportation. Blincoe et al. *The Economic Impact of Motor Vehicle Crashes*. U.S. Department of Transportation, 2002. Council et al. *Safety Evaluation of Red Light Cameras.* U.S. Department of Transportation Federal Highway Administration. 2005.